Western Forest Products Limited

Tree Farm License 19

Nootka Sound – Vancouver Island

Timber Emphasis

VRI Ground Sampling Plan

Submitted to:

Resource Inventory Branch
Ministry of Forests
Victoria, BC

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Doman – Western Lumber Ltd.

Executive Summary

This document provides detailed plans and rationale for the Vegetation Resources Inventory Phase II (Inventory) and Net Volume Adjustment Factor (NVAF) Sampling of Tree Farm Licence 19.

The target population is the Vegetated Treed (VT) portion of TFL 19, excluding private lands, Parks and other legally recognized Protected Areas. Sample polygons were selected from the target population of 6,657 polygons using a stratified probability proportional to size with replacement (PPSWR) sampling technique. This population was reduced from the gross area by targeting only forested polygons with stands greater than 20 years old and by excluding low sites (<300 m^3/ha). Three strata were created based on grouping leading species, age class and total polygon volume from VRI Phase I Forest Cover Maps. Up to 100 VRI sample clusters will be established.

Net volume adjustment factor sampling will enhance up to 20 of the VRI sample clusters. To select NVAF sample plots VRI sample polygons were stratified by age class and leading species, based on VRI Phase I Forest Cover Polygons. All sampling will be completed in 2003. The estimated total cost of the VRI and NVAF are $217,500 collectively. These costs include installation of the VRI sample clusters and statistical analysis.

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Introduction

The Tahsis Tree Farm License 19 (TFL 19) is located on the west side of Vancouver Island in the vicinity of Nootka Sound (Figure 1). It is 80 kilometers due west of Campbell River. The total area of the TFL is approximately 191,992 hectares of which 189,738 hectares are Crown land including timber licenses and 2,254 hectares are fee simple lands owned or controlled by the Licensee. The fee simple (private) lands and lands controlled by the licensee are encompassed in Managed Forest (MF) 20. The eastern boundary abuts onto Strathcona Provincial Park, while to the west it borders Tahsis Inlet and Nootka Island. The western boundary has a diverse shoreline by virtue of several inlets (Espinosa, Zeballos, Tahsis, Tlupana, Muchalaht), which dissect the coastal landscape.

The current forest inventory of TFL 19 was completed in 1989 by Reid, Collins and Associates Ltd. This inventory was based on 1975 and 1980 photography (1:15,840 and 1:20,000) and mapped to 1:20,000. Although this inventory has been regularly updated for denudations and regeneration, a new inventory was needed to reflect current second growth forest conditions.

The photo interpretation phase of the VRI project, based on 1995 photos, was completed in 2001 and provides the bases for the ground sampling plot selection. Delineation and attribution of the photo interpretation was completed and a GIS product was created in 2001. Depletion since the photo date was updated into the VRI prior to ground sample selection.

Funding for this VRI/NVAF project comes from Western Forest Products' (WFP) agreement with Forest Investment Account (FIA). The project was initiated in 2002; it is expected to be complete in March 2004. This VRI Phase II Ground Sampling Plan provides the Vancouver Region of the Ministry of Forests (MOF, the Ministry) and the contractor, Kerley & Associates Forestry Consulting Ltd., with a detailed outline of sampling activities and objectives to be completed over the next year

TFL 19 Landbase

The TFL is 191,992 ha of which 189,738 hectares are Crown land including timber licenses and 2,254 hectares are fee simple lands owned or controlled by the Licensee. The target population is the Vegetated Treed (VT) portion of the TFL, excluding private lands, parks and other officially protected areas where stand age is greater than or equal to 20 years and stand volume

is greater than or equal to 300 m^3/ha. This area of interest (see Figure 2) encompasses 107,347 VT hectares (BC Land cover Classification Scheme). The TFL 19 Phase I photo interpretation of forest cover will provide the basis of units to be sampled. The main tree species strata in the TFL are Hw old 48%, Cw old 20% and Cw Hw young 32%) reported by area as a leading species (Table 1).

Table 1. TFL 19 Land Base.

Age Class	Hectares										Total	
	Ba	**Cw**	**Dr**	**Fd**	**Hm**	**Hw**	**Mb**	**Pl**	**Ss**	**Yc**		
0-20	478		94	488	18	1,158			5	5	2,246	2.1%
21-40	55	116	727	7,917	152	8,976	3	50	16	181	18,193	16.9%
41-60		3	127	460	25	1,732					2,348	2.2%
61-80	14	32	79	988	54	1,421	7	10			2,605	2.4%
81-100	34	270		2,298	3	1,939				75	4,619	4.3%
101-120	12	17		102	77	611		5		23	846	0.8%
121-140	59	776		582		1,486			10	240	3,153	2.9%
141-250	869	5,732		2,132	910	12,895		79	106	5,014	27,737	25.8%
250+	2,040	5,908		1,883	2,111	28,629			4	5,025	45,599	42.5%
Total	**3,561**	**12,855**	**1,028**	**16,850**	**3,350**	**58,847**	**10**	**143**	**140**	**10,564**	**107,347**	
	3.3%	12.0%	1.0%	15.7%	3.1%	54.8%	0.0%	0.1%	0.1%	9.8%		

Area of Interest

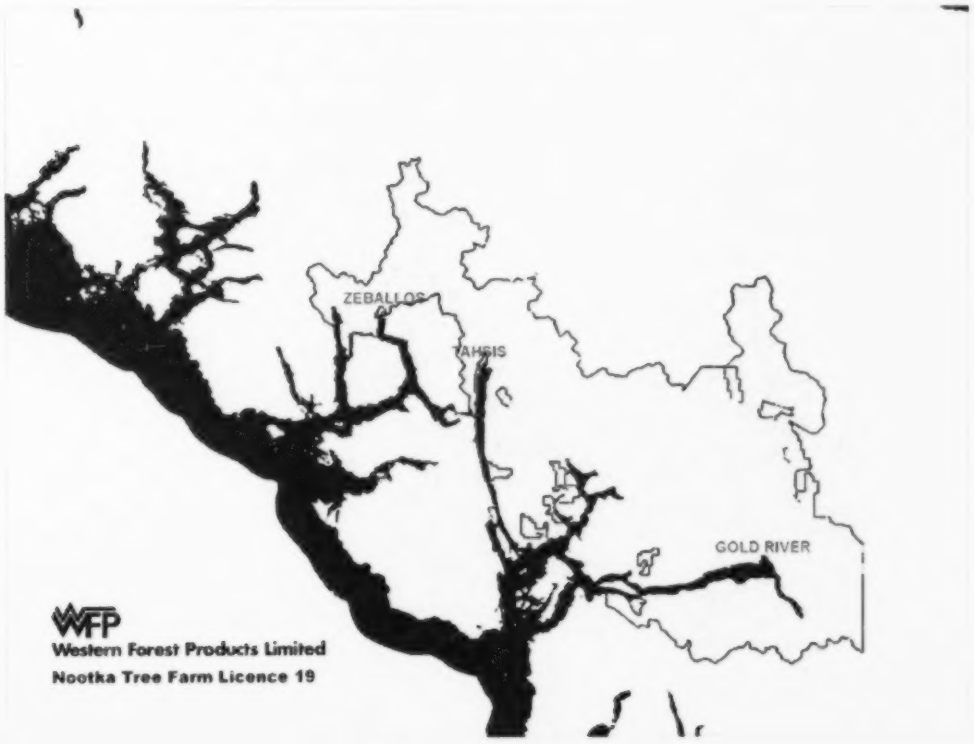

Figure 1: TFL 19

VRI Phase II - Sampling Plan

Objectives

The main objective of this timber emphasis inventory is to:

> *Install a number of VRI sample clusters sufficient to adjust the timber inventory in the TFL Vegetated Treed (VT) areas with a sampling error of ±10% (95% probability) for overall net timber volume in the VT areas.*

Net timber volume is gross volume minus stumps, tops, decay, waste, and breakage. Decay and waste are normally estimated using VRI call grading/net factoring and NVAF sampling.

Sample Size

To meet the inventory objectives (section 2.3), a minimum sample size of 100 VRI sample clusters is recommended, with approximately 48 samples in the Hemlock Old Strata, 20 samples in the Cedar Old Strata and 32 samples in the Cedar/Hemlock Young Strata (Figure 2, Table 2).

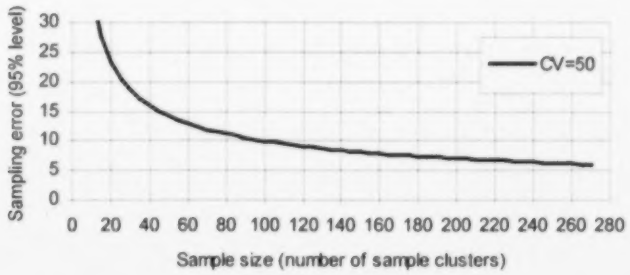

Figure 2. Decreasing sampling error with increasing sample size

Table 2. Sample cluster distribution in the VT land base.

Landbase	Area (%)	Number of clusters
Hemlock Strata **(Hw, Ss, Ba, Hm, Fd)**	**48%**	**48**
Cedar Strata **(Cw, Yc, Dr, Pl, Mb)**	**20%**	**20**
Cedar/Hemlock Strata **(Cw, Yc, Dr, Pl, Mb, Hw, Ss, Ba, Hm, Fd)**	**32%**	**32**
Total	**100**	**100**

Sample Selection

Sample polygons were selected according to the stratified probability proportional to size with replacement (PPSWR) sample selection method and the recently completed Phase I inventory. Appendix A fully outlines the steps in stratifying and selecting samples. Stratification was based

on species groups, age groups and polygon productivity/volume groups. Samples for the entire VT landbase is summarized in Appendix B. Sample allocation to individual strata and substrata was proportional to strata or sub-strata areas. PPSWR was applied to each sub-stratum. Comparison of the VT population and the sample proportions is provided in Appendix C.

Given the exploded plot cluster design with 50m between the main plot and the auxiliary plots, and the detail of the forest cover typing in the TFL (large number of small polygons and/or irregular elongated polygons), the number of auxiliary plots falling outside the selected polygon is demonstrated to be in the order of 30% from past projects. In order to reduce this loss, the distance between the plot centre and auxiliary plot be reduced from 50m to 30m. This will allow maintenance of the provincial grid. Reducing cluster plots distances will lessen the number of plots dropped, improving logistic and sampling efficiency.

Net Volume Adjustment Factor Sampling (NVAF)

The VRI samples enhanced for NVAF measurements are identified in Appendix B. NVAF measurements will include detailed stem analysis of sample trees, calculation of actual net volume, and calculation of the ratio between actual net volume and estimated net volume (where estimated net volume is obtained from net factoring and taper equations). Sixty trees (50 live, 10 dead) selected from 20 VT polygons (selected with at random from the Phase II sample clusters) will be selected in the VT target population and destructively sampled for NVAF. Of the 20 VT polygons, 14 have been selected from mature stands while 6 are from immature stands.

Measurements

The ground samples will be VRI Timber Emphasis (TE) sample clusters. Measurements will be based on the VRI Ground Sampling manual Version 4.3. The decision to do only TE sample clusters has been made, as detailed ecological classification was considered redundant since the entire TFL has been ecologically mapped in detail (to the site series).

The attributes to be sampled will be only those that can be used to adjust the Phase I classification variables. These are:

- Header Information – Card #1, Compass Card #2 & Cluster Layout Card #3 will be completed.

- Tree Details – Card #8 (Main Plot) Data Collected: species, diameter, length, crown class, height to green crown, grade, log length, sound wood percentage (net factor) and wildlife codes.
- Auxiliary Plot – Card # 11 (Auxiliary Plots – 4) Data Collected: species, DBH and all data as recorded on tree detail card for any species not recorded in the main plot. A separate card is completed for each of the four auxiliary plots.
- Tree Loss Indicators – Card # 9 Data Collected: Damage agents, loss indicators and stem mapping bearings and distances. The loss indicators are used in the Net Volume Adjustment sampling.
- Site Tree Data and Small Tree, Stump – Card # 10 Data Collected: Top height and random tree data – heights, ages, etc. This card also records small trees (less than 4cm at DBH) and stumps shorter than 1.3 metres in length.
- Coarse Woody Debris – Cards # 6 & 7 (Card #6 for transect 1 and Card # 7 for transect 2) Data Collected: species, diameter and transect measurements.
  Note: *Coarse Woody Debris data will only be collected where the plot is free from excessive snow and time permits. Plots where data cannot be collected* ***will not*** *be revisited.*

Cruiser Qualification and Quality Assurance

All cruisers are certified in timber measurements and inventory cruising through the Ministry of Forests Resource Inventory Branch and VRI programs. MOF certified cruisers will carry out the NVAF sampling.

The contractor, Kerley & Associates Forestry Consulting Ltd., will be responsible for field sampling quality assurance audits. A minimum of 10% of the samples will be checked with auditing occurring throughout the duration of the project.

Compilation

The MOF ground sample data entry system will be used. Compilation of the ground samples will be contracted out as compilation services are no longer offered by MOF.

Adjustment of Phase I Estimates

The ground samples will be post stratified into species groups by leading species. Where the number of plots is too small (probably < 6) in a stratum, strata will be combined in a logical manner keeping samples with similar ecological characteristics together.

Weighted totals for variables to be adjusted will be calculated for samples in each stratum. A similar computation will be carried out for Phase I estimates of each variable in the sampled polygons and a ratio formed between $Var_{phase\ II}/Var_{phase\ I} = R$ (adjustment ratio).

Schedule

The VRI will be implemented in 2003/04 as follows:

1. Select sample polygons (completed March 2003).
2. Select sample locations in polygons (completed March 2003).
3. Prepare sample packages (completed April 2003).
4. Select a random set of sub-samples for NVAF sampling (completed April 2003).
5. Locate and measure the sample clusters (April – September 2003, Kerley).
6. Sample NVAF sample clusters by Expert Cruiser (April – September 2003, Kerley).
7. Complete stem analysis (September - December 2003).
8. Validate and compile data from completed sample clusters and prepare inventory summary reports (January 2004).
9. Conduct statistical analysis and adjust inventory files (January 2004).

Roles and Responsibilities

Western Forest Products

- Select sample polygons and sample point locations.
- Coordinate project activities, and ensure all contractors are qualified and certified, tender and manage fieldwork contracts.
- Advise contractors on access routes and potential tie points.
- Check data after initial compilation.
- Complete database analysis.
- Prepare sample packages

Kerley & Associates Forestry Consulting Ltd.

- Assess access and coordinate the use of helicopters.
- Complete field sampling.
- Conduct internal quality control.
- Enter sample data.
- Complete NVAF call grading/net factoring and destructive sampling.
- Validate and compile data.

Ministry of Forests, Vancouver Region

- Pre-numbered aluminum identity tags.
- Digital grid used for random sample location.
- Compilation of field samples from digital submission.
- Field tally cards.
- Review sample and population comparison.

Approximate Costs

Sample sizes and contract awarded rates for VRI and NVAF enhancements for TFL 19 are listed in Table 3.

Table 3. Cost schedule for VRI and NVAF sampling for TFL 19

VRI/NVAF Activity	Sample size (clusters)	Unit Cost($)	Total Cost ($)
Administration/Project Management			**9,500.00**
VRI Field Sampling	**100**	**1,460.00**	**146,000.00**
NVAF destructive sampling	**60 trees**	**666.67**	**40,000.00**
Quality Assurance			**5,000.00**
Data entry (VRI and NVAF)			**5,500.00**
GPS, Age Microscope Counts			**6,500.00**
Ratio Adjustment Analysis			**5,000.00**
Total			**217,500.00**

Appendix A – Sample Selection

The steps used to select ground samples to be used in the TFL 6 VRI project are outlined below.

1. The database associated with the Phase I classification was checked for any anomalies.
2. A GIS overlay combining the VRI Phase I classification and ecosystem classification was completed so that immature polygons could be clustered into productivity groups.
3. A volume for individual mature polygons was calculated using VDYP to allow polygons to be clustered into volume groups.
4. The classification was partitioned based on the Landcover classification to include only Vegetated Treed polygons.
5. From the resulting list, polygons were stratified base on species groups and age. These groups combined all polygons into either a Hemlock old stratum, a Cedar old stratum or a Cedar/Hemlock young stratum. It was from this stratification that the sample distribution was defined.
6. The population was then broken into further stratums to reflect productivity in young stands and volume classes in older stands. The table below reflects the breakdown:

Table 4. Stratum Breakdown for Sample Selection

Species Group	Age	Site Class	Area (ha)	% of Population	# of Samples	NVAF Samples
Cedar	Old	High	5,657	26%	5	1
		Moderate	8,782	40%	8	2
		Low	7,319	34%	7	1
	Cedar Old Total		21,758	**20%**	**20**	**4**
Hemlock	Old	High	29,787	58%	28	6
		Moderate	16,553	32%	15	3
		Low	5,238	10%	5	1
	Hemlock Old Total		51,578	**48%**	**48**	**10**
Cedar\Hemlock	Young	Good	4,038	12%	4	1
		Medium	24,462	72%	23	4
		Poor	5,511	16%	5	4
	Young Total		34,011	**32%**	**32**	**6**
Total			107,347		**100**	**20**

7. Once each strata was defined the individual polygon areas beginning with the first polygon in the stratum to the last polygon in each stratum was accumulated.
8. As many random numbers as there were allocated samples for each stratum was generated. The random number ranged in size between 0 and the total area of each stratum.

9. The generated random numbers were used to identify the sample polygons. A polygon was selected if a generated random number was larger than the accumulated total area corresponding to the polygon immediately preceding it, and the random number was smaller than or equal to its accumulated area. A polygon had the potential to be selected more than once; however, this did not happen in this project.

Once the polygon selection for each stratum was completed the next step was the determination of a plot location within each polygon. This was done using the provincial-wide sampling 100 x 100m grid that coincides with the federal National Forest Inventory grid.

The steps in selecting the sample location within the polygon:

10. The 100 m grid was overlain on the Phase I polygons and a list made of all grid points falling within each polygon. Each grid point was given a unique ID.
11. A random point was selected within each sample polygon. This random selection was completed by counting up the total number of point within the polygon and then generating a random number between 0 and the total number of points found in the polygon.

The steps taken in selecting the ground samples that would be enhanced for NVAF are outlined:

12. Ground samples were stratified into two age groups: immature and mature by using 120 years as the boundary between age groups.
13. It was then determined that 14 ground samples from the mature group would be selected for NVAF enhancement and 6 ground samples from the immature. **As a general rule, the number of ground samples needed equals the total number of sample trees divided by 3.** For example, if 60 live trees are required, then 20 ground samples should be selected.
14. Each age group strata was sorted by leading species.
15. Ground samples were selected systematically from each age group by calculating the selection interval by dividing the target number of ground samples by the number of samples in the age group. Generating a random number and multiplying this number by the selection interval determined a random start. The next ground sample in the sorted list was then selected for NVAF. The selection interval was then added to the random start and the next ground sample in the sort position was selected. The remaining ground samples were selected by continued adding of the selection interval to the selection number and so until the end of the sorted list of samples was reached.

Appendix B – List of Sample Polygons

Sample #	UTM X	UTM Y	Zone	Polygon	Species Strata	Age Class	NVAF
1	657801.47	5545412.05	9	986	Cedar\Hemlock	21-40	NO
2	673239.39	5524650.79	9	5221	Cedar\Hemlock	21-40	NO
3	693936.94	5529386.03	9	3923	Cedar\Hemlock	0-20	YES
4	286525.82	5498289.84	10	11735	Cedar\Hemlock	61-80	NO
5	645539.27	5544610.63	9	987	Cedar\Hemlock	21-40	NO
6	659797.38	5545493.53	9	934	Cedar\Hemlock	41-60	YES
7	696068.88	5513680.58	9	8209	Cedar\Hemlock	81-100	NO
8	691490.12	5503303.59	9	10862	Cedar\Hemlock	81-100	YES
9	690384.25	5518348.50	9	7030	Cedar\Hemlock	61-80	NO
10	669670.70	5519009.43	9	6815	Cedar\Hemlock	21-40	NO
11	705267.68	5518547.66	9	6799	Cedar\Hemlock	21-40	NO
12	713083.03	5518061.49	9	6757	Cedar\Hemlock	21-40	NO
13	709941.09	5524132.53	9	5366	Cedar\Hemlock	21-40	NO
14	684780.49	5528416.49	9	4255	Cedar\Hemlock	121-140	YES
15	705074.38	5528335.16	9	4180	Cedar\Hemlock	21-40	NO
16	695952.91	5528967.55	9	4029	Cedar\Hemlock	21-40	NO
17	704587.42	5498134.14	9	11799	Cedar\Hemlock	0-20	NO
18	666968.89	5531392.19	9	3194	Cedar\Hemlock	41-60	YES
19	698751.77	5509091.60	9	29404	Cedar\Hemlock	21-40	NO
20	701451.16	5496609.58	9	12025	Cedar\Hemlock	21-40	NO
21	706286.50	5535481.22	9	2711	Cedar\Hemlock	21-40	NO
22	702181.45	5495839.54	9	212208	Cedar\Hemlock	0-20	NO
23	649842.98	5539589.18	9	2071	Cedar\Hemlock	21-40	NO
24	705187.45	5540435.49	9	1995	Cedar\Hemlock	0-20	NO
25	653610.38	5540342.93	9	1973	Cedar\Hemlock	41-60	NO
26	652903.71	5540513.96	9	1875	Cedar\Hemlock	21-40	NO
27	652970.87	5541316.34	9	1629	Cedar\Hemlock	21-40	NO
28	683841.37	5512088.36	9	8543	Cedar\Hemlock	101-120	NO
29	686792.65	5505812.21	9	10380	Cedar\Hemlock	121-140	NO
30	669972.06	5528815.71	9	4100	Cedar\Hemlock	21-40	NO
31	649686.47	5536084.53	9	2650	Cedar\Hemlock	41-60	NO
32	669912.88	5540107.90	9	1957	Cedar\Hemlock	81-100	YES
33	672643.57	5512234.88	9	8758	Hemlock	141-250	NO
34	675947.85	5512068.95	9	8546	Hemlock	141-250	NO
35	704319.96	5544599.50	9	1072	Hemlock	250+	YES
36	700031.83	5514539.52	9	7924	Hemlock	141-250	NO
37	656178.15	5548444.60	9	764	Hemlock	250+	NO
38	698458.92	5516375.12	9	7561	Hemlock	141-250	YES
39	674316.73	5517798.81	9	7105	Hemlock	141-250	NO
40	287934.41	5501031.43	10	11116	Hemlock	250+	NO
41	693210.20	5517662.91	9	6979	Hemlock	141-250	NO

Sample #	UTM X	UTM Y	Zone	Polygon	Species Strata	Age Class	NVAF
42	676793.55	5520797.30	9	6211	Hemlock	141-250	NO
43	691363.49	5499002.02	9	11593	Hemlock	250+	NO
44	285404.50	5497735.09	10	11861	Hemlock	250+	YES
45	688059.33	5523951.40	9	5312	Hemlock	141-250	NO
46	708936.99	5496809.48	9	12059	Hemlock	250+	NO
47	701094.62	5527875.23	9	4364	Hemlock	250+	NO
48	713493.49	5527773.51	9	4206	Hemlock	250+	NO
49	653367.85	5543831.48	9	1260	Hemlock	250+	NO
50	656265.89	5543849.94	9	1276	Hemlock	250+	YES
51	683566.90	5528767.19	9	3977	Hemlock	250+	NO
52	704922.43	5529628.51	9	3773	Hemlock	250+	NO
53	705517.21	5529752.38	9	3703	Hemlock	250+	NO
54	656978.22	5555775.04	9	152	Hemlock	250+	NO
55	684934.54	5532021.00	9	3270	Hemlock	250+	NO
56	705744.39	5531560.81	9	3228	Hemlock	250+	NO
57	668183.90	5540837.24	9	1748	Hemlock	250+	NO
58	714164.86	5513507.30	9	28340	Hemlock	141-250	YES
59	709405.38	5530008.55	9	2817	Hemlock	141-250	YES
60	652009.71	5540377.46	9	1981	Hemlock	250+	NO
61	696996.00	5508021.72	9	9791	Hemlock	141-250	NO
62	284262.61	5509172.80	10	9536	Hemlock	141-250	NO
63	674376.06	5518800.55	9	6874	Hemlock	141-250	YES
64	698385.23	5505779.21	9	10446	Hemlock	250+	NO
65	703778.04	5523285.34	9	5608	Hemlock	250+	NO
66	677949.17	5524342.02	9	5322	Hemlock	250+	NO
67	696133.14	5526975.74	9	4525	Hemlock	250+	NO
68	710758.87	5528663.43	9	3915	Hemlock	250+	YES
69	705748.40	5531461.01	9	3388	Hemlock	250+	NO
70	706242.67	5509192.43	9	29425	Hemlock	250+	YES
71	690756.94	5499177.44	9	11594	Hemlock	250+	NO
72	284590.46	5497367.90	10	11926	Hemlock	250+	NO
73	671819.52	5542384.57	9	1542	Hemlock	250+	NO
74	668984.60	5543268.88	9	1383	Hemlock	250+	NO
75	697908.04	5495268.47	9	12328	Hemlock	250+	NO
76	713701.83	5515087.87	9	7895	Hemlock	141-250	NO
77	699442.95	5524210.45	9	5336	Hemlock	250+	YES
78	661836.21	5551874.60	9	406	Hemlock	250+	NO
79	701106.05	5530074.74	9	3760	Hemlock	250+	NO
80	711111.77	5497396.05	9	11898	Hemlock	250+	NO
81	703197.75	5507871.10	9	9939	Cedar	141-250	NO
82	688479.77	5508578.20	9	9720	Cedar	141-250	YES
83	699661.73	5508828.37	9	9691	Cedar	141-250	NO
84	678334.11	5512365.38	9	8744	Cedar	141-250	NO

Sample #	UTM X	UTM Y	Zone	Polygon	Species Strata	Age Class	NVAF
85	703196.26	5517864.80	9	6826	Cedar	141-250	NO
86	679667.36	5511519.97	9	8940	Cedar	141-250	NO
87	677715.34	5512839.99	9	8533	Cedar	141-250	NO
88	685338.01	5522042.47	9	5914	Cedar	141-250	YES
89	648849.66	5534551.10	9	2835	Cedar	250+	NO
90	686931.83	5507316.68	9	210083	Cedar	141-250	NO
91	702867.74	5496166.79	9	12168	Cedar	250+	YES
92	704068.44	5501110.97	9	11122	Cedar	250+	NO
93	704890.70	5498046.37	9	11607	Cedar	250+	NO
94	694169.82	5511205.73	9	8987	Cedar	141-250	NO
95	690645.72	5511863.23	9	8715	Cedar	141-250	NO
96	704553.16	5518918.75	9	6863	Cedar	141-250	NO
97	684183.97	5523395.03	9	5549	Cedar	250+	NO
98	691431.85	5524587.27	9	5172	Cedar	141-250	YES
99	673478.13	5518764.15	9	26977	Cedar	141-250	NO
100	694761.59	5506432.94	9	210361	Cedar	141-250	NO

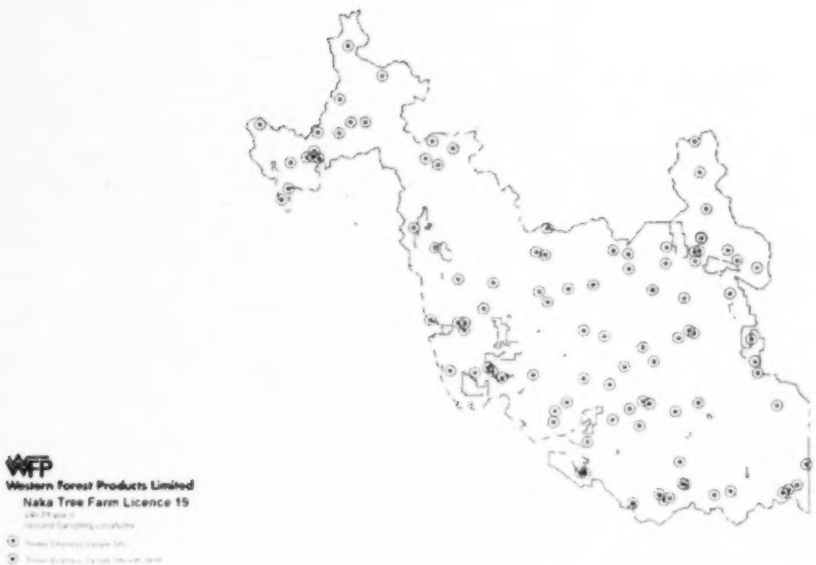

Figure 3. TFL 19 Ground Sample Distribution

Appendix C – Comparison between the population and the sample polygons

The following graphs and table depict the comparison between population and sample percentage by Site Class, Age Class and Leading Species. The population values are area percentages, and the sample values are proportions of number of samples. The graphs and table suggests that the selected sample is representative of the Vegetated reed target population.

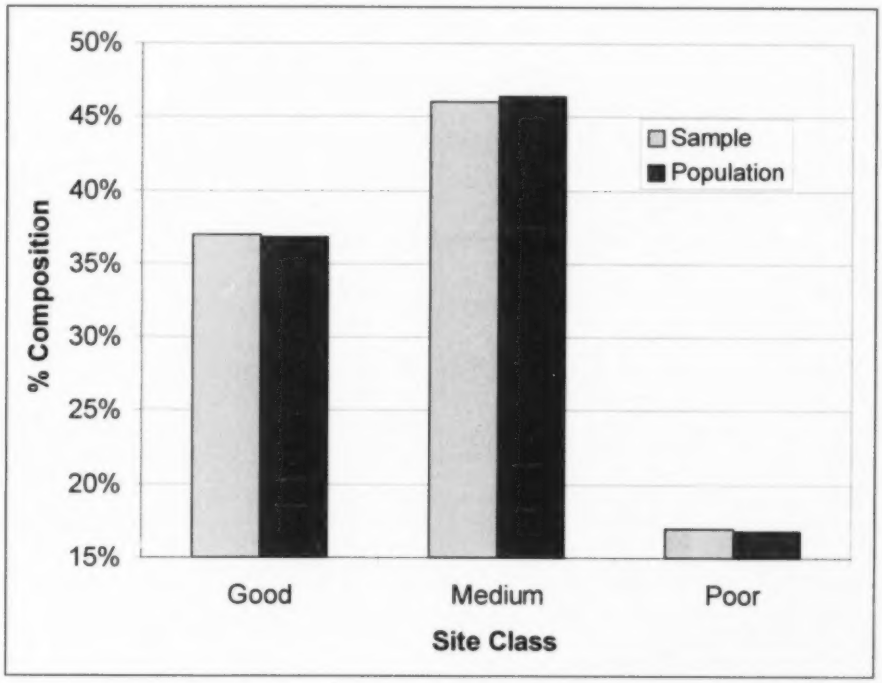

Figure 4. Distribution of target and sample population by site index.

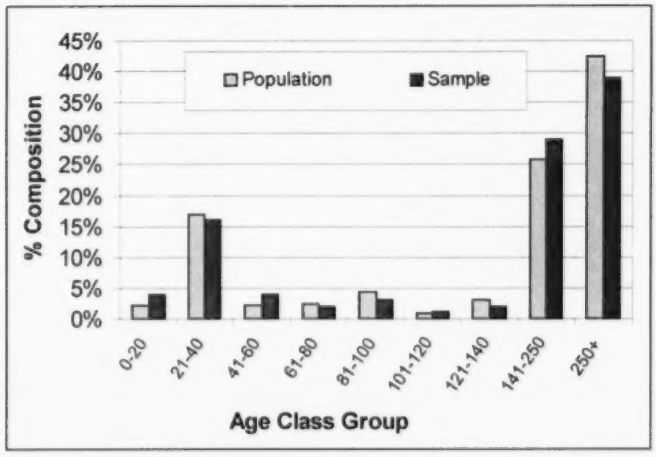

Figure 5. Distribution of target and sample population by age class.

Table 5. Comparison of Population Area vs. Samples

			Composition	
Species Strata	Age	Class	Population	Sample
Cedar	Old	High	26%	25%
		Moderate	40%	50%
		Low	34%	25%
	Old Total		20%	20%
Hemlock	Old	High	58%	60%
		Moderate	32%	30%
		Low	10%	10%
	Old Total		48%	48%
Cedar\Hemlock	Young	GOOD	12%	17%
		MEDIUM	72%	67%
		POOR	16%	17%
	Young Total		32%	32%